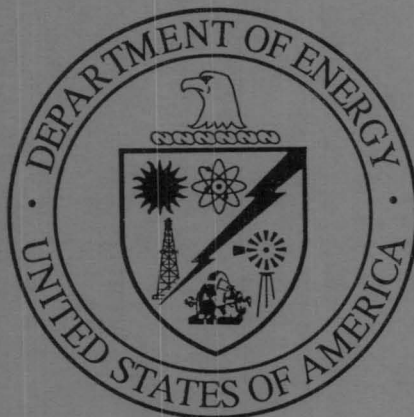


Sandia National Laboratories/New Mexico

**PROPOSAL FOR
CONFIRMATORY SAMPLING NO FURTHER ACTION
ENVIRONMENTAL RESTORATION SITE 112
EXPLOSIVES-CONTAMINATED SUMP
OPERABLE UNIT 1335**

May 1997

**Environmental
Restoration
Project**



**United States Department of Energy
Albuquerque Operations Office**

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Prepared by
Sandia National Laboratories/New Mexico
Environmental Restoration Project
Albuquerque, New Mexico

Prepared for
the U.S. Department of Energy

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1-1
1.1	Description of ER Site 112.....	1-1
1.2	No Further Action Basis	1-3
2.0	HISTORY OF ER SITE 112.....	2-1
2.1	Historical Operations	2-1
2.2	Previous Audits, Inspections, and Findings.....	2-3
3.0	EVALUATION OF RELEVANT EVIDENCE	3-1
3.1	Unit Characteristics and Operating Practices.....	3-1
3.2	Results of Sampling/Surveys	3-1
3.2.1	Results of Prior Investigations	3-1
3.2.2	Confirmatory Sampling.....	3-1
3.3	Gaps in Information	3-12
3.4	Risk Evaluation	3-12
4.0	RATIONALE FOR NO FURTHER ACTION DECISION.....	4-1
5.0	REFERENCES.....	5-1
6.0	ANNEXES	6-1
6.1	Analytical Results—Wastewater Residue, Building 9950, November 1989.....	6-1
6.2	Analytical Results—Gun Powder Residue, Building 9956, July 1990.....	6-1

LIST OF FIGURES

Figure		Page
1-1	Location Map for ER Site 112	1-2
2-1	Site Map for ER Site 112	2-2
3-1	Concrete Coring Operation During Sampling.....	3-2
3-2	Removed Concrete Core and Sampling Borehole	3-2

LIST OF TABLES

Table		Page
3-1	VOC Field Screening Results at ER Site 112	3-3
3-2	Summary of TAL Metals in Confirmatory Samples Collected at ER Site 112 Boreholes.....	3-5
3-3	Summary of VOCs in Confirmatory Samples Collected at ER Site 112 Boreholes.....	3-6
3-4	Summary of Explosives in Confirmatory Samples Collected at ER Site 112 Boreholes (off-site laboratory)	3-7
3-5	Summary of Gamma Spectroscopy Results in Samples Collected at ER Site 112 (on-site laboratory)	3-9

ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CEARP	Comprehensive Environmental Assessment and Response Program
cm	centimeters
COC	constituents of concern
DOE	Department of Energy
DOU	Document of Understanding
DU	depleted uranium
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ES&H	Environmental Safety and Health
IH	Industrial Hygiene
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
ug/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mm	millimeter(s)
MS	matrix spike
MSD	matrix spike duplicate
NFA	No Further Action
OU	Operable Unit
PID	photoionization detector
QA/QC	quality assurance/quality control
RPD	relative percent difference
SAP	sampling and analysis plan
SNL/NM	Sandia National Laboratories/New Mexico
SWHCP	Site-Wide Hydrogeologic Characterization Project
SWTA	Southwest Test Area
TAL	Target Analyte List
UTL	upper tolerance limit
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 Description of ER Site 112

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a No Further Action (NFA) decision based on confirmatory sampling for Environmental Restoration (ER) Site 112, the Explosives-Contaminated Sump in Building 9956, part of Operable Unit (OU) 1335, Southwest Test Area (SWTA). ER Site 112, formerly included in OU 1298, was identified in the Hazardous and Solid Waste Amendment Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act Hazardous Waste Management Facility Permit (NM5890110518-1) (EPA August 1992).

SNL/NM occupies 2,829 acres of land owned by the Department of Energy (DOE), with an additional 14,920 acres of land provided by land-use permits with Kirtland Air Force Base, the United States Forest Service, the State of New Mexico, and the Isleta Pueblo. SNL/NM has been involved in nuclear weapons research, component development, assembly testing, and other nuclear activities since 1945 (DOE September 1987).

ER Site 112 is located under the present Building 9956, which is located in the Coyote Test Field Area, east of Technical Area III (Figure 1-1). Building 9956 is operated by the Experimental Impact Physics Department, Organization 1433. However, since June 1995, the site has remained inactive. The site is on land owned by the U.S. Air Force, permitted to DOE and SNL/NM.

ER Site 112 lies on the western margin of the Sandia Fault Zone at an elevation of 5,483 feet above mean sea level. The geologic materials underlying the site consist of thick alluvial sediments which overlie deep bedrock. An alluvial fan and piedmont colluvium overlies the Santa Fe Group Strata. The Santa Fe deposits are estimated to be approximately 3,000 feet thick beneath ER Site 112. Detailed descriptions of the regional geology are in the annual Site-Wide Hydrogeologic Characterization Project (SWHCP) 1994 Annual Report (SNL/NM March 1995).

SWHCP soil surveys and surficial mapping provide general soil characteristics for the area around ER Site 112. The dominant soil groups in the area include the Tome—very fine sandy loam, and the Tijeras—gravely fine sandy loam. The soils underlying the site are defined as the Tijeras gravely fine sandy loam. The estimated recharge rate for soils in the area ranges between 0.002 and 0.071 centimeters per year (cm/yr), which yields downward seepage velocities ranging between 0.03 and 11.8 cm/yr (SNL/NM October 1995).

No perennial surface-water bodies are present in the immediate vicinity of ER Site 112. The nearest principal ephemeral surface drainage is the Arroyo del Coyote, which is about 1 mile north of the site. Drainage of Arroyo del Coyote and several unnamed arroyos on the southern portions of OU-1335 flows westward toward the Rio Grande.



ER Site 112 lies in the HR-2 geohydrologic region described in the SWHCP 1994 Annual Report (SNL/NM March 1995). This region is an intermediate geohydrologic zone between the HR-1 zone to the west and the HR-2 zone to the east. It is comprised of a northeast/southwest-trending fault complex which includes segments of Sandia, Tijeras and Hubbell Springs Faults.

The uppermost interval of groundwater saturation in HR-2 will be found as unconfined to semi-confined aquifers in the alluvial facies of the Santa Fe Group and Piedmont alluvium, and as semi-confined to confined aquifers in the local bedrock units. Examples of these two aquifer models are found in two wells located near the site. Monitoring well AVN-1, which is 5,100 feet north of Building 9956, is screened in the Santa Fe Group alluvial fan facies. Depth to groundwater in this well is 508 feet below ground surface (bgs). Monitoring well LMF-1 is 6800 feet to the southeast of the site. Depth to groundwater in this well is 347 feet bgs. This well is screened in the Abo Sandstone (SNL/NM March 1996).

1.2 No Further Action Basis

This request for an NFA determination for ER Site 112, the Explosives Contaminated Sump, is based primarily on analytical results of confirmatory soil samples collected from boreholes drilled in the sump area. Review and analysis of the analytical data indicate that all concentrations of constituents of concern (COCs) at this site were not detected or are below the 95th upper tolerance limit (UTL) or percentile, as applicable, for SNL/NM background levels. Therefore, ER Site 112 is being proposed for an NFA determination based on confirmatory sampling data demonstrating that COCs that may have been released into the environment pose an acceptable level of risk under current and projected future land use, NFA Criterion 5 of the Environmental Restoration Document of Understanding (DOU) (NMED April 1996).

2.0 HISTORY OF ER SITE 112

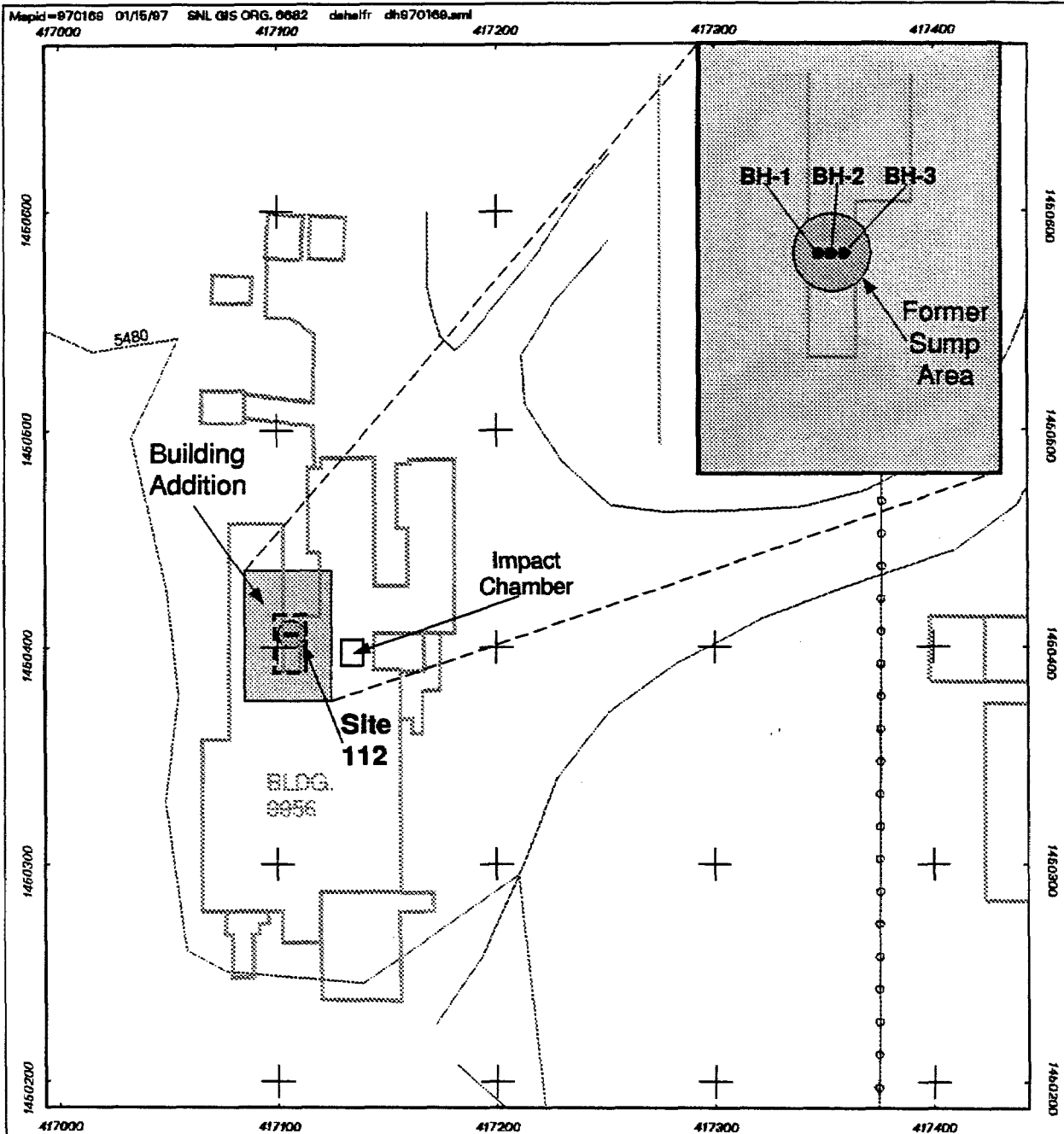
2.1 Historical Operations

Building 9956 houses an impact chamber consisting of an 89-millimeter (mm) powder gun used to conduct experiments on various small, thin metal targets. The original unit was installed in 1969, and was still operational in 1995. A small explosive charge was detonated at one end of a 60-foot tube with targets at the other end typically consisting of non-hazardous materials, except for some tests involving beryllium.

In 1980, a series of 15 experiments involving beryllium targets was conducted with the 89-mm powder gun in Building 9956. In this series of experiments, projectiles were fired at beryllium targets, expending one target per test. Powdered explosive charges were used to propel the projectiles, but black powder was reportedly never used in this gun (SNL/NM ES&H Records Center 1995b). Each target was a small beryllium disk, 7.6-centimeters (cm) in diameter and 0.04 to 0.09-cm thick, attached to an aluminum target holder. The beryllium targets were arranged in a 1.8 by 4.9-meter impact chamber (see Figure 2-1 for impact chamber location). A negative pressure airlock was constructed around the chamber to prevent the release of hazardous materials during the tests (SNL/NM ES&H Records Center 1994a; SNL/NM ES&H Records Center, 1994b; Wise, et. al. 1982).

SNL Industrial Hygiene (IH) Department provided guidance and monitoring during the tests. According to available site background information and an interview with personnel (SNL/NM ES&H Records Center 1994a), all remaining target materials were collected after each experiment, bagged and disposed of by the IH organization. The impact chamber was then washed out with a surfactant and rinsed with approximately 55 gallons of potable water. This water was flushed out into a plastic-lined trench and discharged into a series of three holes in the ground on the west side of the original building. Each hole was approximately the size of a 55-gallon drum. This is the sump area shown in Figure 2-1. The plastic lining in the trench was then removed and disposed of (SNL/NM ES&H Records Center 1994a). Interviews indicated that the powder used in firing the 89-mm gun was completely expended during each experiment. Tests involving depleted uranium (DU) were never conducted in this gun. Other guns in Building 9956 were used for tests that included DU, but the impact chambers were wiped clean rather than rinsed with water (SNL/NM ES&H Records Center 1995a).

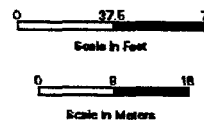
In 1982-1983, an addition was added onto Building 9956 (Figure 2-1). During construction, the soil in the sump area was reportedly excavated and removed from the area (SNL/NM ES&H Records Center 1994a and SNL/NM ES&H Records Center 1994c), although disposition of the excavated soil is unknown. Off-site soil was backfilled into the sump area, compacted, and an addition with a concrete floor was constructed over the site (SNL/NM ES&H Records Center 1994a and SNL/NM ES&H Records Center 1994c).



Legend

- Sample Location
- Road
- 10 Foot Contour
- ▤ Building
- Fence
- ▨ ER Site 112

Fig. 2-1
Site Map for ER Site 112
Bldg. 9956 Explosives-
Contaminated Sump



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

2.2 Previous Audits, Inspections, and Findings

The site was first reported in the 1985 Comprehensive Environmental Assessment and Response Program (CEARP) (DOE September 1987). According to this information, Building 9956 was used to weigh black powder charges and the sump used for disposing of wastewater that may have contained black powder residues. Improved process history has shown that this information is erroneous. The weighing of black powder was actually performed in Building 9957 (SNL/NM ES&H Records Center 1995b).

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics and Operating Practices

As discussed in Section 2.1, a negative pressure airlock was constructed around the chamber to prevent any material release to the surroundings during the 1980 tests using the beryllium targets. The sump and surrounding soils were excavated during construction of the building addition, removing or dispersing any potential COCs from the site.

According to available site background information and interviews, all potentially hazardous target materials were collected after each experiment, bagged and disposed of by the SNL/NM IH organization. As stated in Section 2.1, the impact chamber was then flushed with approximately 55 gallons of potable water and the wastewater drained to the sump. The sump area was backfilled and a concrete floor slab was constructed over it in 1982-1983.

3.2 Results of Sampling/Surveys

3.2.1 Results of Prior Investigations

No previous sampling of the effluent from the beryllium tests or of the soils in the sump area has been conducted. Results from the analysis of wastewater generated in Building 9956 in 1989 during similar tests indicate that past discharges to the sump did not constitute hazardous waste (Section 6.1). Samples of residue collected from similar powder gun tests in Building 9950 in 1990 did identify low concentrations of hazardous and radiological constituents (Section 6.2). It is uncertain if the available analyses of typical wastewater or powder gun residues are representative of material disposed to the sump in Building 9956 in the 1970s and early 1980s. Nor can the effects of the accumulation of small concentrations of hazardous constituents be quantified. Evidence from interviews with site personnel suggests that hazardous materials were not discharged to the sump and that the soil in the area was excavated from the site during construction of the building addition. However, neither of these assumptions could be fully verified. For these reasons, a confirmatory sampling program at ER Site 112 was warranted to confirm that the soils underlying the site did not contain significant levels of COCs.

3.2.2 Confirmatory Sampling

In June 1996, the 1-foot thick concrete floor of the addition was cored, then three boreholes were drilled and sampled in the former breezeway area where the sump was originally located (Figures 2-1, 3-1 and 3-2). The boreholes were drilled and sampled according to the procedures described in the OU 1335 site-specific sampling and analysis plan (SAP) with the following exceptions:



Figure 3-1. Concrete Coring Operations During Sampling



Figure 3-2. Removed Concrete Core and Sampling Borehole

- (1) No visible evidence of soil contamination, staining, or discoloration was observed during the confirmatory sampling event. However, because of a strong odor detected during sample collection activities, the headspace in the sample jars was screened for volatile organic compounds (VOCs) using a photoionization detector (PID). The PID results are summarized in Table 3-1. VOCs were detected in borehole BH-1 (3-5 foot depth interval - 35 units over background) and at the 6-8 foot sampling depth interval (0.04 units above background). No VOCs were detected in samples from BH-2 or BH-3. Because of the PID anomalies, the decision was made to collect samples for laboratory VOC analysis. These analytical results are discussed in Section 3.2.2.1.
- (2) According to the SAP, the boreholes were to be sampled at depth intervals of 3-5 and 6-8 feet below the concrete floor at each borehole location. These sampling depths were selected to ensure that samples of native soil below the depth of the backfilled soil were collected for analysis. The 3-5 foot depth intervals in boreholes BH-2 and BH-3 could not be collected because of the large amount of rounded aggregate under the concrete floor that sloughed into the boreholes and hampered sample recovery. Removal of large quantities of the aggregate was necessary to sample the lower intervals. Also, at the lower sampling interval of borehole BH-1, only enough soil was recovered for VOC analysis because of large cobbles or rocks that prevented advancing the sampling tube any further. Table 3-1 reflects the lengths of the intervals sampled in each borehole.

Table 3-1
VOC Field Screening Results ER Site 112 Boreholes

Sampling Borehole	Actual Sampling Interval	ER Sample ID (From Table 3-2)	PID Value (units above background [background = 0 units])
BH-1	3-5 feet	112-GR-001-005-SS	35
BH-1	6-6.5 feet	112-GR-001-5-SS	0.04
BH-2	6-9 feet	112-GR-002-5-SS	0
BH-3	6-9 feet	112-GR-003-5-SS	0

3.2.2.1 Summary of Soil Analytical Results

The analytes selected for the confirmatory sampling event were based on the type of tests that generated the effluent. The Target Analyte List (TAL) metals analysis (EPA Method 6010 and 7470/7471) was selected because the components of the 89-mm powder gun and the impact chamber were metallic and some of the targets were composed of beryllium. Explosives analyses (EPA Method 8330) were performed to detect residues of any igniters or propellants

used in the tests. Gamma spectroscopy, performed at the on-site SNL/NM radiochemistry laboratory, was intended to detect any residues from uranium targets used in other gun tests in Building 9956 (SNL/NM March 1993). Analysis for VOCs (EPA Method 8240) was performed to determine the source of the odors detected during sampling activities and to detect the residues of degreasing solutions that may have been used to clean the gun or targets, then flushed out with the wastewater. All chemical analyses with the exception of #028038-05 (for VOCs) were performed at General Engineering Laboratories, Charleston, South Carolina. Sample #028038-05 was analyzed at the SNL/NM on-site laboratory to quickly obtain a measure of any VOC contamination below the concrete floor. Level II data validation was performed on the analytical results and is discussed in Section 3.2.2.6.

Results were then compared to the SNL/NM background 95th UTLs, or percentiles, as applicable, for subsurface soils from the SWTA. If the concentration exceeds the background level, or if there is no background level for a particular parameter, then a risk assessment is warranted. A risk assessment analysis is not performed for analytes that are not COCs. The chemical results for metals, explosives, and VOCs were evaluated using this process. Similarly, radionuclides were evaluated by comparing them to background concentrations or by evaluating their state of equilibrium. If they appear to be of anthropogenic origin, then a risk assessment is performed. Analytical results are presented in Tables 3-2, 3-3, 3-4, and 3-5.

3.2.2.2 *Metals*

One sample for nickel (#028033-022, concentration 28.2 milligrams per kilogram [mg/kg]) was above the background level of 11.5 mg/kg at the 95th percentile, but is within the background range (0.5 to 60.2 mg/kg) for the SWTA. All but two of the thallium concentrations (with a maximum of 1.84 mg/kg) are above the 95th percentile for SNL/NM background concentrations (<1.1 mg/kg), but are well within the range of thallium concentrations for SNL/NM background (0.0011 to 7.1 mg/kg). Based on available site history, neither nickel nor thallium is considered a COC at ER Site 112. Beryllium, the single metal COC, is below the 95th percentile or UTL for background samples. Results for metals above the 95th percentile and for the COC metal of concern (Be) are shown in Table 3-2. Based on the reported concentrations, metals (including Be) do not pose a threat to human health or the environment at ER Site 112.

3.2.2.3 *VOCs*

VOCs were not a COC for the site, but samples were collected for analysis based on odors and subsequent PID readings detected during sampling. All VOCs, except for acetone, 2-butanone, and methylene chloride, are below detection limits. These compounds are common laboratory contaminants and not considered COCs at Site 112. This is supported by the presence of these compounds in the trip blank, sample #28043-05. It is possible that the odor and PID readings were from the decay of organic material below the concrete slab or from residues from vehicular traffic during construction that were not detectable in soil samples by U.S. Environmental Protection Agency (EPA) Method 8240. The evaluation of the analytical data indicates that VOCs are not a COC for the site and do not pose a threat to human health or the environment.

Table 3-2
Summary of TAL Metals in Confirmatory Samples Collected at ER Site 112 Boreholes
(Off-site Laboratory)

TAL Metals 6010 and 7470/7471									
COC No.	Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth (Figure 1-2)	Be	Ni	Tl	Units
5385	028029-02	112-GR-001-3-SS	Soil	6/18/96	BH-1 3 - 6 feet	0.244	4.6	1.84	mg/kg
5385	Soil Duplicate 028030-02	112-GR-001-SSD	Soil	6/18/96	BH-1 3 - 6 feet	0.263	5.06	0.201	mg/kg
5385	028032-02	112-GR-002-3-SS	Soil	6/19/96	BH-2 6 - 8 feet	0.199	4.4	1.2	mg/kg
5390	028033-02	112-GR-002-5-SS	Soil	6/20/96	BH-2 6 - 9 feet	0.27	28.2	1.36	mg/kg
5385	028034-02	112-GR-003-3-SS	Soil	6/19/96	BH-3 3.5 - 6 feet	0.232	4.26	0.207	mg/kg
5390	028035-02	112-GR-003-5-SS	Soil	6/20/96	BH-3 6 - 9 feet	0.195	8.9	1.3	mg/kg
	Equipment Blank 028037-02	112-GR-003-5-EB	Water	Equipment Blank 6/20/96	NA	ND (0.0000114)*	0.00654	ND (0.00207)	mg/L
5390	Field Blank 028036-02	112-GR-003-FB	Water	Field Blank 6/20/96	NA	ND (0.0000114)	0.00162	ND (0.00207)	mg/L
Subsurface Background Range ^b						0.10 - 1.6	0.5 - 70.2	0.0011 - 7.1	mg/kg
Background UTL or 95th percentile ^b						0.65	11.5	<1.1	mg/kg

* Values in parenthesis represent the method detection limits.

^b Background range for SNL/NIM sitewide background data (IT March 1996).

Be = Beryllium.

COC = Chain of custody.

EB = Equipment blank (rinse).

ER = Environmental restoration.

FB = Field blank.

ft = Feet.

ID = Identification number.

mg/kg = Milligram/kilogram.

mg/L = Milligram/liter.

NA = Not applicable.

ND = Nondetect; the analyte was not observed above the method detection limit.

Ni = Nickel.

SS = Subsurface soil sample.

SSD = Subsurface soil sample duplicate.

Tl = Thallium.

UTL = Upper tolerance limit.

Table 3-3
Summary of VOCs in Confirmatory Samples Collected at ER Site 112 Boreholes

COC No.	Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth (Figure 1-2)	VOCs Method 8240			
						2-Butanone	Methylene Chloride	Acetone	Units
5387	028038-05	112-GR-001-005-SS	Soil	6/19/96	BH-1 3-5 feet	ND (5)*	< 1	42	ug/kg
5390	028031-05	112-GR-001-5-SS	Soil	6/20/96	BH-1 6 - 6.5 feet	3.21	4.69	23.3	ug/kg
5390	028033-05	112-GR-002-5-SS	Soil	6/20/96	BH-2 6 - 9 feet	ND (2)	2.73	7.15	ug/kg
5390	028039-05	112-GR-002-5-SSD	Soil	6/20/96	BH-2 6 - 9 feet	ND (2)	3.84	12.4	ug/kg
5390	028035-05	112-GR-003-5-SS	Soil	6/20/96	BH-3 6 - 9 feet	ND (2)	4.39	12.5	ug/kg
5390	028043-05	112-GR-003-5-TB	Water	6/20/96	NA	11.8	4.38	13.9	ug/L
5390	028041-05	112-GR-003-5-FB	Water	6/20/96	NA	ND (2)	1.14	3.91	ug/L
5390	028042-05	112-GR-003-5-TB	Water	6/20/96	NA	ND (2)	< 1	ND (2)	ug/L
5390	028040-05	112-GR-003-5-EB	Water	6/20/96	NA	ND (2)	1.23	3.32	ug/L

* Values in parenthesis represent the method detection limits.

COC = Chain of custody.

EB = Equipment blank (rinse).

ER = Environmental restoration.

FB = Field blank.

ID = Identification number.

NA = Not applicable.

ND = Nondetect; the analyte was not observed above the method detection limit.

SS = Subsurface soil sample.

SSD = Subsurface soil sample duplicate.

TB = Trip blank.

VOC = Volatile organic compound.

ug/kg = Microgram/kilogram.

ug/L = Microgram/liter.

Table 3-4
Summary of Explosives in Confirmatory Samples Collected at Site 112 Boreholes
(Off-site Laboratory)

Explosives, Methods 8330												
COC No.	Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth (Fig. 1-2)	2,4,6-trinitrotoluene	2,4-dinitrotoluene	2,6-dinitrotoluene	2-Amino-4,6-dinitrotoluene	4-Amino-2,6-dinitrotoluene	HMX	Units
5385	028029-04	112-GR-001-3-SS	Soil	6/18/96	BH-1 3-6 ft	ND (75) ^a	ND (75)	ND (75)	ND (75)	ND (75)	ND (225)	ug/kg
5385	028030-04	112-GR-001-3-SSD	Soil	6/18/96	BH-1 3-6 ft	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ND (225)	ug/kg
5385	028032-04	112-GR-002-3-SS	Soil	6/18/96	BH-2 6-8 ft	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ND (225)	ug/kg
5390	028033-04	112-GR-002-5-SS	Soil	6/20/96	BH-2 6-9 ft	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ND (225)	ug/kg
5385	028034-04	112-GR-003-3-SS	Soil	6/19/96	BH-3 3.5-6 ft	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ND (225)	ug/kg
5390	028035-04	112-GR-003-5-SS	Soil	6/20/96	BH-3 6-9 ft	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ND (225)	ug/kg
5390	028037-04	112-GR-003-5-EB	Water	6/20/96	NA	ND (0.0234)	ND (0.039)	ND (0.039)	ND (0.0273)	ND (0.039)	ND (0.0585)	ug/L
5390	028036-04	112-GR-003-5-FB	Water	6/20/96	NA	ND (0.0234)	ND (0.039)	ND (0.039)	ND (0.0273)	ND (0.039)	ND (0.0585)	ug/L

Refer to footnotes at end of table.

Table 3-4, continued
Summary of Explosives in Confirmatory Samples Collected at Site 112 Boreholes
(Off-site Laboratory)

Explosives, Methods 8330														
COC No.	Sample Number	ER Sample ID	Sample		Sample Depth (Fig. 1-2)	Nitrobenzene	RDX	TETRYL	m-dinitro-benzene	m-nitrotoluene	o-nitrotoluene	p-nitrotoluene	sym-trinitrobenzene	Units
			Matrix	Date										
5385	028029-04	112-GR-001-3-S9	Soil	6/18/96	BH-1 3-6 ft	ND (75)	ND (225)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ug/kg
5385	028030-04	112-GR-001-3-SSD	Soil	6/18/96	BH-1 3-6 ft	ND (75)	ND (225)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ug/kg
5385	028032-04	112-GR-002-3-S9	Soil	6/18/96	BH-2 6-8 ft	ND (75)	ND (225)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ug/kg
5390	028033-04	112-GR-002-5-S9	Soil	6/20/96	BH-2 6-9 ft	ND (75)	ND (225)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ug/kg
5385	028034-04	112-GR-003-3-S5	Soil	6/19/96	BH-3 3.5-6 ft	ND (75)	ND (225)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ug/kg
5390	028035-04	112-GR-003-5-S9	Soil	6/20/96	BH-3 6-9 ft	ND (75)	ND (225)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (75)	ug/kg
5390	028037-04	112-GR-003-5-EB	Water	6/20/96	NA	ND (0.0273)	ND (0.0585)	ND (0.078)	ND (0.0234)	ND (0.0234)	ND (0.0234)	ND (0.0234)	ND (0.0273)	ug/L
5390	028036-04	112-GR-003-5-FB	Water	6/20/96	NA	ND (0.0273)	ND (0.0585)	ND (0.078)	ND (0.0234)	ND (0.0234)	ND (0.0234)	ND (0.0234)	ND (0.0273)	ug/L

*Values in parenthesis represent the method detection limit.

COC = Chain of custody.

EB = Equipment blank (rinse).

ER = Environmental restoration.

FB = Field blank.

ft = Feet.

ID = Identification number.

ug/kg = Microgram per kilogram.

ug/L = microgram per liter.

NA = Not applicable.

ND = Nondetect. The analyte was not observed above the method detection limit.

SS = Subsurface soil sample.

SSD = Subsurface soil sample duplicate.

Table 3-5
Summary of Gamma Spectroscopy Results in Samples Collected at ER Site 112 Boreholes
(On-site Laboratory)

COC No.	Sample Number	ER Sample ID	Sample Matrix	Sample Date	Sample Depth (Figure 1-2)	Gamma Spectroscopy Activity ^a							Units
						U-238 ^b	Th-234 ^b	Ra-226	Th-232 ^b	Ra-228 ^b	U-235 ^b	Cs-137 ^b	
5374	028029-01	112-GR-001-3-SS	Soil	6/18/96	BH-1 3 - 6 feet	ND (6.42E-01)	ND (2.65E-01)	1.08E+00	4.85E-01	5.29E-01	ND (9.65E-02)	ND (1.61E-02)	pCi/g
5388	028038-01	112-GR-001-5-SS	Soil	6/19/96	BH-1 3 - 6 feet	ND (1.15E+00)	4.92E-01	1.14E+00	5.60E-01	5.72E-01	ND (1.63E-01)	ND (3.29E-02)	pCi/g
5376	028032-01	112-GR-002-3-SS	Soil	6/19/96	BH-2 6 - 8 feet	5.83E-01 (1.31E+00)	6.60E-01 (4.99E-01)	9.18E-01 (7.17E-01)	5.65E-01 (4.22E-01)	4.37E-01 (3.12E-01)	ND (1.69E-01)	ND (3.44E-02)	pCi/g
5439	028033-01A	112-GR-002-5-SS	Soil	6/20/96	BH-2 6 - 8 feet	ND (1.29E+00)	ND (4.19E-01)	ND (6.52E-01)	ND (2.41E-01)	ND (2.99E-01)	ND (1.63E-01)	ND (3.79E-02)	pCi/g
5439	028033-01B	112-GR-003-5-SS	Soil	6/20/96	BH-2 6 - 8 feet	ND (9.32E-01)	5.02E-01 (4.40E-01)	ND (4.59E-01)	5.60E-01 (2.43E-01)	5.90E-01 (3.18E-01)	7.05E-02 (1.85E-01)	ND (3.82E-02)	pCi/g
5376	028031-01	112-GR-003-3-SS	Soil	6/19/96	BH-3 3.5 - 6 feet	ND (1.25E+00)	ND (4.40E-01)	ND (6.66E-01)	ND (2.43E-01)	ND (3.18E-01)	ND (1.85E-01)	ND (3.82E-02)	pCi/g
5439	028035-01A	112-GR-003-5-SS	Soil	6/20/96	BH-3 6 - 9 feet	ND (1.23E+00)	ND (4.32E-01)	ND (6.40E-01)	ND (2.37E-01)	ND (3.14E-01)	ND (1.73E-01)	ND (3.64E-02)	pCi/g
5439	028035-01B	112-GR-003-5-SS	Soil	6/20/96	BH-3 6 - 9 feet	ND (6.02E+03)	ND (1.96E+03)	ND (3.42E+03)	ND (1.39E+03)	ND (2.10E+03)	ND (9.29E+02)	6.84E+04	pCi/g
5439	Lab Control	60099005	Water	NA	NA	0.153 - 2.2	0.11 - 2.34	0.337 - 3.33	0.113 - 1.18	0.105 - 1.18	0.004 - 3.0	0.000 - 3.47	pCi/g
SNL/NM SWTA Background Range ^c						1.40E+00	1.40E+00	1.76E+00	1.01E+00	9.30E-01	1.60E-01	7.89E-02	pCi/g
SNL/NM SWTA Soil Background UTL or 95th percentile ^c						0.153 - 2.2	0.11 - 2.34	0.337 - 3.33	0.113 - 1.18	0.105 - 1.18	0.004 - 3.0	0.000 - 3.47	pCi/g

^a U-238 and Th-232 decay chain isotopes with a short half-life are not presented in this table.

^b Value in parenthesis represents the minimum detection activity.

^c Background range for U-234 and U-235 from SNL/NM sitewide background data (IT March 1996).

COC = Chain of custody.

Cs = Cesium.

ER = Environmental restoration.

ft = Feet.

ID = Identification.

NA = Not applicable.

ND = Nondetect; the analyte was not observed above the method detection limit.

pCi/g = Picocuries per gram.

Ra = Radium.

SS = Subsurface soil sample.

Th = Thorium.

U = Uranium.

UTL = Upper tolerance limit.

3.2.2.4 *Explosives*

All explosive constituents analyzed at ER Site 112 are below detection limits (Table 3-4). Explosives are not considered to be a COC at the site.

3.2.2.5 *Radionuclides*

Because of the incomplete site history and the use of DU in other tests in Building 9956, soils were screened for radioactive constituents using gamma spectroscopy (Table 3-5). The detectable activities of uranium-238, thorium-234, radium-226, thorium-232, radium-228, thorium-228, and uranium-235 were all below SNL/NM background levels (IT March 1996). Short-lived daughters (half-life of less than 6 months) of the radionuclides were also detected in the analyses. A number of the daughters (lead-214, bismuth-214, actinium-228, radium-224, lead-212, bismuth-212, and thallium-208) do not have established background levels because their short half-lives preclude their existence, naturally or otherwise, without their longer-lived parent nuclides being present. Using the approximation that relatively short-lived radionuclide daughters reach secular equilibrium with their longer-lived parent nuclide in approximately seven half-lives, it was determined that the levels of these short-lived radionuclides were also representative of background. Since there was not an established background level for thorium-228, this same methodology was used to determine that thorium-228 levels were naturally occurring by using the documented background levels for its longer-lived parent nuclides radium-228 and thorium-232. Potassium-40, though detected, is only attributable to natural sources and, therefore, has not been included in the data summary table. It appears that radionuclides are not COCs and do not pose a threat to human health or the environment at ER Site 112.

3.2.2.6 *Quality Assurance/Quality Control Summary*

Field and laboratory quality assurance/quality control (QA/QC) samples were collected and analyzed to evaluate data quality. The following subsections summarize the QA/QC data and findings.

Data Verification and Validation

Verification and validation of laboratory data were performed in accordance with the SNL/NM Environmental Safety and Health (ES&H) Records Center "Verification and Validation of Chemical and Radiochemical Data" Revision 0 (TOP [Technical Operating Procedure] 94-03) (SNL/NM July 1994). Data validation was performed on metals, VOCs, and explosives data using Level 1 and Level 2 checklists specified in the procedure.

Field Quality Assurance/Quality Control Data

Field QA/QC samples submitted to General Engineering Laboratories for sampling activities at ER Site 112 include one field duplicate, two field blanks, a trip blank, and two equipment rinsate

blank samples. Eight laboratory control samples (LCS) and eight laboratory control sample duplicates (LCSD) were extracted and analyzed in addition to three matrix spike (MS) and three matrix spike duplicate (MSD) samples. Results for the QA/QC samples are discussed below.

Field Duplicate Sample

One duplicate surface soil sample was collected and analyzed for VOCs. No VOCs were detected with the exception of acetone and methylene chloride. Acetone was detected at 12.4 micrograms per kilogram (ug/kg), and methylene chloride was detected at 3.84 ug/kg indicating that where these constituents are detected in the environmental sample they are likely laboratory contaminants. The relative percent difference (RPD) values between the environmental and corresponding duplicate samples are 53.7 for acetone and 33.8 for methylene chloride.

Field and Equipment Rinsate Blanks

Aqueous equipment rinsate blanks were collected following completion of soil sampling and final equipment decontamination at ER Site 112. No explosives or VOCs were detected in any of the equipment rinsate and field blank samples except for methylene chloride and acetone which, again, are likely to be laboratory contaminants. The results obtained from analysis of the blank samples indicate that project samples were not cross-contaminated by the sampling equipment or containers.

Matrix Spike and Matrix Spike Duplicate Analyses

Analyses of MS and MSD samples were performed to assess sample matrix effects on analytical accuracy and precision, in accordance with requirements of the SAP. The MS analysis was performed in accordance with approved laboratory procedures. MS/MSD results reported are in the analytical data reports as percent recovery and RPD. MS/MSD samples were analyzed for explosives and metals. The MS and MSD sample results for explosive compounds are within percent recovery and RPD limits. The MS and MSD results for metals are within percent recovery and RPD limits. No MS/MSD analyses were performed for VOCs. MS and MSD results may be found the SNL/NM ES&H Records Center.

Laboratory Quality Assurance/Quality Control Data

Laboratory QA/QC samples were analyzed by General Engineering Laboratories and include LCS and LCSD analyses for soil and water samples and method blank analyses. Results for the laboratory QA/QC analyses of these samples may be found in the SNL/NM ES&H Records Center. All percent recovery and RPD values for the explosives, VOCs, and metals analytes are within control limits.

Nonconformances/Variations to Sampling and Analysis Plan

A nonconformance is an unplanned and unintended deviation from the established sampling and analysis plan or procedures. A variance is an approved and controlled change to the established SAP or procedures. There were no nonconformance/variance issues associated with the sampling at ER Site 112.

3.3 Gaps in Information

According to available historical information, there is no evidence that any soil samples were collected around the excavated sump area before construction of the addition was started at the site. The soil in the sump area was reportedly excavated and disposed of during construction. To verify whether the site history contained any inconsistencies, soil samples were collected to determine if there were any detectable COCs remaining in the soil.

3.4 Risk Evaluation

A formal risk assessment analysis is not required for ER Site 112. No explosives residues were detected. Only naturally occurring radionuclides were detected and were all well within the SNL/NM background levels or in secular equilibrium and therefore are naturally occurring. Beryllium was the only metal listed as a COC, and all the concentrations detected were below the SNL/NM background UTL. All the other TAL metals were at concentrations below the 95th percentile of SNL/NM background values for soil except for nickel and thallium, which were still well with the range of background. VOCs were not a COC for the site and were all below detection.

Ecological risk has not been addressed in this NFA proposal because the ecological risk for ER Site 112 has not been estimated at this time. Site-wide ecological risk analyses are being conducted, and the relevant analysis for this site will be presented when available. However, the site is beneath the concrete floor of a research facility that was constructed in the early 1980s, and soil samples collected underneath the floor did not detect any significant levels of COCs. Therefore, it is highly unlikely that ER Site 112 poses any ecological risk.

4.0 RATIONALE FOR NO FURTHER ACTION DECISION

Based on the evaluation of site history, background information, and analytical data, the following evidence should be evaluated when considering ER Site 112 for an NFA determination:

- (1) Process knowledge indicates that only a very small quantity of a COC (beryllium) was used in targets at the site, and all debris was physically recovered after the testing. Effluent volumes were minimal since only 15 beryllium tests were conducted, each using approximately 55 gallons of rinse water.
- (2) Soils from the sump and surrounding area were excavated and removed from the site in 1982-1983, effectively removing or dispersing any COCs that may have accumulated from discharges to the sump area.
- (3) The absence of COCs in the soils analyzed during the confirmatory sampling event indicates that no significant levels of residual COCs are still present at the site.

Therefore, NFA Criterion 5 from the DOU for a confirmatory sampling NFA proposal applies: ER Site 112 has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Based upon the evidence cited above, no evidence remains of a release of COCs which may pose a threat to human health or the environment. Therefore, ER Site 112 is recommended for an NFA determination.

5.0 REFERENCES

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¹Because many of the tests conducted at SNL/NM are classified, the SNL/NM reference numbers refer to a SNL/NM Records Center coding system intended to maintain the confidentiality of SNL/NM employees.

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October 13, 2003

ADDITIONAL /SUPPORTING DATA

**CAN BE VIEWED AT THE
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